REMARKS

Reconsideration and further examination are respectfully requested.

Rejections under 35 U.S.C. §112, second paragraph

Claim 43 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner has stated that there is no antecedent basis for the language of 'said time counter.' The Examiner is respectfully directed towards the preamble of claim 40, from which claim 43 depends, which recites "... an edge node ... having ... a time counter..." Applicant thus submits that there is sufficient antecedent basis for the language of 'said time counter' in claim 43, and request that the rejection be withdrawn. The term "reading" is defined in the specification.

Rejections under 35 U.S.C. §102

Claim 1 was rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 6,118,762 to Nomura et al., hereinafter 'Nomura.'

Nomura:

Nomura describes a burst transfer system in which communication terminals output 'a communication reservation request which is made up of destination information including the address of the transmitting side communication terminal and the address of the receiving side communication terminal, and band information representing the start time, the use band of the burst transfer, etc.' (Nomura, Abstract). At column 2, lines 18-24, Nomura characterizes his invention as:

"A burst transfer system of the present invention is designed such that a communication terminal reserves a band to be used in the burst transfer prior to the execution of the burst transfer whereas a communication network side ensures the burst transfer to be conducted in the reserved band..."

Applicant notes that the term 'band' is used in Nomura to indicate a time interval. See for example claim 2: "a time band represented by a communication starting time and a length of communication time of burst transfer".

As described at column 6, lines 35-39:

"... the request analyzing unit 5 extracts the communication start time and the band information from the communication reservation request and inputs the extracted communication start time and band information into the band reserving unit 7"

At column 7, lines 9-17, Nomura describes:

"... in the case where there exists no path having an unused band in the path after the communication start time, or in the case where there exists no path having an unused band more than a band specified by the band information in the paths having the unused band after the communication start time, the band reserving unit 7 transmits to the communication terminal of the requester for a communication reservation request the information representing that reservation is not acceptable..."

In the request-grant burst-transfer system described in the disclosure of Nomura (first filed in August 1995), a source node in a network sends a burst-transfer request to the network's core and waits for permission to send the burst. The burst-transfer request specifics a starting time and burst duration. When a request is accepted, the core reserves a path for the forthcoming burst then sends a permit to the requesting source node. **The path remains idle between the time it is reserved and the time it is used.** In a network of wide coverage, the idle time caused by the request-grant message exchange can be excessive, due to large propagation delays, resulting in low network utilization. For this reason, such a scheme would be limited to

networks of relatively small geographic coverage as in the local-area-network example considered by Nomura (FIG. 2).

A person skilled in the art knows that a very similar scheme, called "fast circuit switching" was proposed for telephone networks more than two decades ago. The scheme, though unused, was quite suitable because the data flow rates in telephony are relatively small and, hence, the burst duration may be much larger than the idle time required for request-grant signaling between successive bursts.

In the envisioned high-speed networks, accommodating much higher flow rates (e.g., 10 gigabits per second), the burst durations would be orders of magnitude smaller than the burst durations contemplated for conventional low-speed networks and, hence, the use of the fast-circuit-switching technique, or any technique in which network resources are kept idle between successive data bursts due to request-grant signaling would be unthinkable. This realization, together with the emergence of fast optical-switching nodes, led researchers to abandon the request-grant technique of Nomura and develop open-loop burst-switching techniques according to which a source node sends a burst-transfer request to an optical core node then sends the data burst itself after a predetermined "offset" period without waiting for permission from the optical core node. The offset period is presumably sufficient to configure the core node (and subsequent core nodes, if any). The request from the source node indicates the size of the accompanying burst and its destination. Responsive to this burst transfer request, the core node attempts to connect a specific channel in a link, on which the burst will be received, to any channel in a link directed towards the requested burst destination. The core node may fail to schedule the transfer of the burst from input to output at the respective burst arrival time, and, if the core node does not include a buffer, the burst may be lost.

The open-loop burst-switching schemes are attractive but have a major drawback: the network occupancy has to be kept quite low in order to reduce burst loss to an acceptable level.

In AAPA, specifically United States patent application 9/750,071, now US patent 6,907,002, issued June 14, 2005 to Beshai *et al.* and titled "Burst switching in a high capacity network", a pipelined closed-loop request-grant scheme that minimizes idle time between successive bursts is disclosed. According to the pipeline scheme, a source node defines the size of each burst and sends a burst-transfer request to a core scheduler without waiting for transmission schedules of preceding bursts. As stated in the summary (col. 2, lines 10-13) "Instead of handling burst requests one-by-one, burst requests are pipelined and the handling of the bursts is scheduled over a long future period."

Also, please see the abstract of 6,907,002: "At a master controller of a space switch in a node in a data network, **a request is received from a source node** that requests a connection to be established through the space switch. ---- The scheduling is pipelined and performed in a manner that attempts to reduce mismatch intervals of the occupancy states of input and output ports of the space switch. The method thus allows efficient utilization of the data network resources while ensuring virtually no data loss."

In a radical departure from both the per burst request-grant technique of Nomura (or fast-circuit-switching) and the subsequent open-loop burst-switching techniques, the method of the instant invention enables the core nodes to generate burst-transfer permits based on flow-rate allocations. Thus, the latency of the per-burst request-grant process is entirely eliminated. The core nodes receive flow-rate-allocation specifications from edge nodes and generate burst-

transfer permits accordingly. **Thus, the burst sizes and transmission times from the source nodes are determined by core nodes.**

This novel method has three main advantages: (1) it eliminates burst loss, (2) it eliminates idle time between successive bursts – hence realizing a highly-efficient burst-switching network, and (3) it achieves low latency. The method of the instant invention permits the construction of an optical-burst switching-network of Global coverage where a large round-trip propagation delay between any two edge nodes would be masked.

Thus, in contrast with the prior art, in the present invention a core node determines the timing and size of bursts issued by each edge node. Each core node distributes timed burst transfer permits to the edge nodes, and each edge node assembles data into bursts as indicated by the respective permits and transmits the bursts according to the permit schedule. Such an arrangement is fundamentally different and superior to that described by Nomura.

Accordingly, Applicant's claim 1 is clearly distinguishable from Nomura, which neither describes nor suggests "...method of burst switching in a network that includes at least one core node and a plurality of edge nodes, comprising the steps of ... generating, by said core node, at least one edge-node-specific burst transfer permit ... distributing, by said core node, said at least one edge-node-specific permit to at least one of said plurality of edge nodes; and ... sending, by at least one of said plurality of edge nodes, data bursts to said core node, *the data bursts being assembled responsive to information in said burst-transfer permit...*"

The Examiner states, at page 2 of the office action "Nomura et al teaches generating a burst transfer permit and sending it to an edge node (see col. 13, lines 55+) wherein the edge nodes send data bursts based on this (transmission timing period tb) information. See col 13, lines 57+.

Applicant notes that Nomura clearly indicates that the communication duration and start time are determined by the communication terminal. Please see Col. 13, lines 51- 54 " .. the communication terminal transmits a communication request Ta representing a communication reservation request such as a communication start time, a communication time length, ..." In Column 11, lines 32-36, Nomura describes that the communication terminal specifies a "rate" for a communication request, where the term "rate" refers to the ratio of the requested time interval to a predefined "periodic term". Using this information, the system of Nomura determines whether a communication request (a burst) can be supported. The system of Nomura *does not* provide any feedback regarding how to assemble a data burst by the terminal, it merely provides an indication of whether there is capacity for a given identified data transfer.

Accordingly, for at least the reason that Nomura fails to describe or suggest 'the data bursts being assembled responsive to information in the burst-transfer permit', claim 1 is patentably distinct over Nomura, and the rejection should be withdrawn.

Rejections under 35 U.S.C. §103

Claims 2-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,118,762 to Nomura.

It is well known that to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest

all the claim limitations. The Examiner has failed to establish a prima facie case of obviousness with Nomura for at least the reasons provided below.

No Motivation is Provided for Modifying the References

With regard to claim 2, the Examiner states "the star configuration shown in Figure 1 is an obvious variation of a star configuration "with a second core" since it is stated in col. 10, lines 5+ that there are three ATM switches in core 3." Applicant fails to understand how the *contents* of the core of Nomura form a basis for the *addition* of a core to Nomura. However, assuming one would be motivated to modify Nomura to include an additional core, it could be argued that the additional core would be arranged in a network configuration such as that shown in Figure 2 of Nomura, which is clearly not a star network, or a composite star network. Applicant would direct the Examiner's attention to the fact that claim 2 recites 'a composite star network', which is described in Applicant's instant specification (and known in the art) as a group of star networks, wherein "the core nodes 140 of a composite-star network are not connected to each other..." Please see page 8 of the specification of the instant invention: "A composite star network 100, illustrated in FIG. 1, may be viewed as a superposition of several star networks which are merged only at the edge nodes 120 while the core nodes 140 can be widely distributed and independent. ----- The core nodes 140 of a composite-star network are not connected to each other."

For at least the reason that the modification suggested by the Examiner would fundamentally alter the operation of Nomura, Applicant submits that no motivation for such a modification can be found.

With regard to claims 3-7, 10 and 11 the Examiner fails to provide any motivation for the modification of Nomura, but merely points to passages of Nomura. As such, the rejection under 35 U.S.C. §103 is *prima facie* improper and should be withdrawn.

With regard to claim 8, the Examiner states that it would be obvious to modify Nomura to 'have sent data simultaneously to the core nodes in order to promote a greater data transfer rate...' As there is no teaching or suggestion in Nomura for the addition of a core node, Applicant can only infer that the Examiner is improperly using hindsight based on the teaching of Applicant's instant specification. As such, the rejection is improper and should be withdrawn.

With regard to claim 9, the examiner states "it would have been obvious to equalize the delays in order to promote more efficient data transfer between the edge nodes and the core nodes..." Applicant can find no teaching or suggestion in Nomura of delays. Thus Applicant can further find no motivation for equalizing delays. It can only be inferred that the Examiner is improperly using hindsight based on the teachings of the present invention. As such, there is no proper motivation and the rejection should be withdrawn.

References neither describe nor suggest the limitations of the present invention

Claims 2-11:

However, even assuming that a motivation could be found for modifying the references as suggested by the Examiner, the references still fail to describe or suggest several limitations of Applicant's claims.

Applicant notes that claims 2-11 serve to add further patentable limitations to claim 1. If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Claim 1 has been

shown to be patentably distinct from Nomura for the reasons provided above, and thus it would fall that claims 2-11 are also patentably distinct over Nomura for at least the same reason as claim 1. However, there are several limitations of the dependent claims which have merit highlight by the Applicant.

For example, claim 2 recites "... wherein said core node and edge nodes are arranged in a composite-star configuration with a second core node..." As stated above, there is no teaching or suggestion of a composite-star network in Nomura, and for at least this reason claims 2 and 8 (which is also directed to multiple disjoint core nodes) are distinct from Nomura. Claim 3 includes the step of "...specifying, with each of said edge-node-specific burst transfer permits, burst size and destination...." Nomura neither describes nor suggests such a limitation. Rather, throughout Nomura, it is clear that the communicating terminal provides the burst information and the destination address in their request (see Figure 6 of Nomura). Claim 4 recites the step of specifying, with said edge-node-specific burst transfer permits, arrival time at said core node. Although Nomura forwards a transmission time within a period to the terminal, this neither describes nor suggests 'arrival time at said core node.' Claim 5 recites the step of receiving, with each edge node, permits from each core node. As Nomura fails to show or suggest multiple core nodes, claim 5 is patentably distinct over Nomura.

Claim 6 recites the "step of each edge node sending data bursts to each core node according to a burst size specified by a respective permit..." As described previously above, no burst size is forwarded *to* the terminal of Nomura. Rather, the terminal of Nomura seeks a request for burst transfer based on a pre-identified burst size. For at least this reason claim 6 is patentably distinct from Nomura. Claim 7 recites the step of "...each of said edge nodes determining the timing of transmitting data bursts to each core node so that each of said data

bursts arrives at a corresponding core node at said required arrival time..." This step is not described or suggested by Nomura. Claim 9 recites the step of "...wherein said network has collocated edge nodes and core nodes, and including the further step of facilitating said timing by substantially equalizing propagation-delays from the edge nodes to the core nodes...." As shown above, no multiple cores are shown in Nomura, and Nomura is silent as to any correlation of delays between transmitting terminals.

Claim 10 recites "The method of claim 8 including the further step of facilitating said timing by time locking each edge node to each core node...." Please refer to page 2 of the specification of the instant invention: "Effective time-sharing in a bufferless-core network requires that the edge nodes be time-locked to the core nodes, that all nodes be fast-switching, and that a path between two edge nodes traverses a single optical core node."
No such structure could be shown or suggested by Nomura. It is further noted that Nomura describes heavy use of buffering technology, and therefore would not require the use of time-locking as claimed by the Applicant. Claim 11 recites "... including the further step of causing said edge-node-specific burst-transfer permits to be conflict-free..." The Examiner states "... there would inherently be no conflict if the information is properly transferred..." Applicant would note that it is the point of Nomura to remove conflicts, by refusing requests. However, the language of the claim is directed towards '*burst-transfer permits* to be conflict free..." There is no mention or suggestion in Nomura that the communications to the terminals that are described at column 13 of Nomura, and characterized as 'permits' by the Examiner have any protection over conflict.

For at least the reason that Nomura fails to describe or suggest several limitations of the claims, claims 2-11 are patentably distinct over Nomura, and the rejection should be withdrawn.

Claims 12-22:

Claims 12-22 were rejected under 35 U.S.C. §103(a) as being obvious over Applicant's Admitted Prior Art (AAPA) in view of Nomura.

The Examiner states, at page 4 of the Office Action:

"... With regard to claim 12, AAPA teaches burst switching ... in an optical network (page 1 lines 12+) and discusses the problem of burst latency on page 4 lines 1+. AAPA does not however teach a solution to this problem to comprise having a scheduler in the core node schedule the burst information to the edge nodes. This is taught in Nomura et al as discussed above. It would have been obvious to one of ordinary skill in the art at the time of the invention to have solved the burst latency discussed in AAPA through the use of scheduling permits, in light of the teachings of Nomura et al in order to increase the proper flow of data in the system..."

Claim 12 recites "...Network communication equipment that facilitates burst switching, comprising ... a plurality of edge nodes ... a core node having a plurality of optical switches, each of said optical switches including ... a burst scheduler operative to generate at least one edge-node-specific burst transfer permit ... a transmitter operative to distribute said at least one edge-node-specific permit to a plurality of edge nodes; and ... a receiver operative to receive data bursts sent from said edge nodes to said core node ... wherein said data bursts are *assembled responsive to information in* said burst-transfer permit...." No mention is shown or suggested in Nomura, AAPA, or the combination thereof of the limitations of claim 12. In AAPA, the scheduler schedules bursts whose sizes are defined by the edge nodes while the core scheduler of the instant invention defines the sizes of each burst. For at least this reason, claim 12 is patentably distinct over the references, and the rejection should be withdrawn.

Dependent claims 13-22 serve to add further patentable limitations to claim 12, in a manner similar to those described above with regards to claims 2-11. However, for at least the reason that they depend upon an unanticipated parent claim, claims 13-22 are also patentably distinct over the references, and it is respectfully requested that the rejection be withdrawn.

Claims 23-35:

Claims 23-35 were rejected as being obvious over Nomura. The Examiner states, at page 4 of the Office Action:

Claim 23 recites "...A method of burst switching in a communication network having at least one core node and a plurality of edge nodes, comprising the steps of ... sending, by at least one of the edge nodes, a bitrate allocation request for a node pair, said request being sent to a controller of the core node ... generating, by a controller of the core node, at least one edge-node-specific burst transfer permit corresponding to the bitrate allocation request, *including updating the bitrate allocation request for the node pair and including an updated bitrate allocation in the burst transfer permit* , distributing said at least one edge-node-specific burst transfer permit by said controller to at least one of the plurality of edge nodes; and sending data bursts from at least one of the plurality of edge nodes to said core node based at least in part upon said burst-transfer permit...." As described at length above, no such structure is shown or suggested by Nomura. Accordingly, for at least this reason, claim 23 is patentably distinct over Nomura and the rejection should be withdrawn. Claims 25-35 serve to further limit claim 23 and are allowable for at least the same reasons as claim 23.

Claims 36-39:

Claims 36-39 were rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent 6,405,257 to Gersht et al in view of U.S. patent 6,944,128 to Nichols. Claims 36-39 were cancelled without prejudice, and thus this rejection is moot.

Claims 40-43:

Claims 40-43 were rejected under 35 U.S.C. §103(a) as being obvious over Nomura in view of U.S. Patent 6,721,271 to Beshai.

Claim 40 recites the step of "...receiving burst-transfer permits at said controller, *the burst transfer permits including a burst size...*" As described at length above, no such limitation is shown or suggested in Nomura.

In U.S. Patent 6,721,271, Beshai teaches a method of switching data packet traffic belonging to multiple classes of service (please see claim 1 in 6,721,271) but does not provide a method of **data burst formation.** As described in page 16 of the specification of the instant application, "The packet data at each output port (not illustrated) of a source node are sorted into queues according to destination sink nodes and **the packet data of each queue are aggregated into bursts** ----". The method in 6,721,271 does not include either of the two steps:

> distributing said burst-transfer permits to respective output ports; and
> concatenating, at said corresponding output port, segments of a common destination to form data bursts according to respective burst-transfer permits;

which are central to the burst-switching method of the instant invention.

For at least the reason that the combination of references fails to disclose or suggest every limitation of the claims, claim 40 is patentably distinct over the references, and it is requested that the rejection bet withdrawn. Dependent claims 41-43 serve to add further patentable limitations to claim 40 and are allowable with claim 40.

Conclusion:

Applicant made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Applicant's Attorney at the number listed below so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

3/6/06
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